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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/842,802	04/27/2001	Takao Noguchi	206645US0	2819

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EXAMINER

SONG, MATTHEW J

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 10/17/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/842,802

Applicant(s)

NOGUCHI ET AL.

Examiner

Matthew J Song

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2 and 4-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 4-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites, "a perovskite layer on said oxide thin film" in line 5 and "a perovskite oxide thin film on said buffer layer" in line 8. It is unclear if the two perovskite are the same layer or are different layers because the oxide layer is the buffer layer.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1,2 and 4-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Yano et al (US 5,801,105).

Yano et al discloses a multilayer thin film of BaTiO₃ (001)/Pt (001)/BaTiO₃ (001)/ ZrO₂ (001)/Si (100), note column 28, lines 54-67. The ZrO₂ (001) layer reads on applicant's buffer layer of an oxide thin film of zirconium or of a rare earth element. Yano et al also discloses tungsten bronze type compounds and the perovskite compounds used are BaTiO₃, SrTiO₃, PLZT, PZT, CaTiO₃ and PbTiO₃ (col 12, ln 15-55). Yano et al also discloses the substrate can be

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gallium arsenide and Si (100) (col 12, ln 55-65). Yano et al also discloses a perovskite/film composed of zirconium oxide stabilized with rare earth metal element/silicon structure is effective for improving the crystallinity of an oriented film to formed thereon, for example, films of ferroelectric materials and electrode films of Pt (col 14, ln 20-35).

Referring to claim 1, Yano et al discloses a BaTiO_3 layer, which is inherently ferroelectric, note Nashimoto (US 5,834,803) column 1, lines 30-36.

Referring to claim 2, Yano et al is silent to the perovskite has insulating properties, however this is inherent to Yano et al because Yano et al discloses a similar material as applicant, therefore a similar material will inherently have similar properties.

Referring to claim 4-5, Yano et al discloses Yano et al also discloses tungsten bronze type compounds and the perovskite compounds used are BaTiO_3 , SrTiO_3 , PLZT, PZT, CaTiO_3 and PbTiO_3 (col 12, ln 15-55).

Referring to claim 6, Yano et al discloses fabricating electronic devices, such as volatile memories, infrared sensors, optical modulators and superconducting sensors (col 29, ln 25-50).

5. Claims 1, 2, and 4-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Yano et al (JP 10-017394), an English computer translation (CT) and an English Abstract have been provided; a accurate translation can be provided upon request.

Yano et al teaches a single crystal silicon substrate, a ZrO_2 thin film (intermediate thin film), a BaTiO_3 film (insulative ground thin film), a Pt film (conductive ground thin film) and a ferroelectric thin film were formed in this order (CT pg 20 [0151])). The ZrO_2 thin film reads on applicants buffer layer, the BaTiO_3 reads on applicant's Perovskite layer and the Pt layer reads

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on applicants electrically conductive layer. Yano et al also discloses the insulative subbing layer has perovskite crystal structure of ABO_3 , where A is Pb and B is Ti; this reads on applicant's $PbTiO_3$. Yano et al also discloses the insulative subbing thin film has a (001) or (100) unidirectional orientation (CT pg 7 [0036]-[0038]). Yano et al also discloses the zirconium oxide thin film is composed mainly of zirconium oxide or zirconium oxide stabilized with a rare earth metal (CT pg 8 [0045]). Yano et al also discloses a silicon substrate with a (100) orientation (CT [0030]). Yano et al also structure of this invention can form electronic devices (CT pg 12 [0074]). Yano et al also discloses in the ferroelectric thin film of $PbTiO_3$, where part of Ti may be replaced by at least Zr (CT pg 7 [0033] and pg 6 [0025]-[0029]), this reads on applicant's PZT.

6. Claims 1, 2, and 4-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Yano et al (JP 10-017394), where US 6,121,647 is used as an accurate translation of JP 10-017394; a accurate translation can be provided upon request.

Yano et al teaches a single crystal silicon substrate, a ZrO_2 thin film (intermediate thin film), a $BaTiO_3$ film (insulative subbing thin film), a Pt film and a ferroelectric thin film were formed in the described order ('647 col 26, ln 40-60). The ZrO_2 thin film reads on applicants buffer layer, the $BaTiO_3$ reads on applicant's Perovskite layer and the Pt layer reads on applicants electrically conductive layer. Yano et al also discloses the insulative subbing layer has perovskite crystal structure of ABO_3 , where A is Pb and B is Ti; this reads on applicant's $PbTiO_3$. Yano et al also discloses the insulative subbing thin film has a (001) or (100) unidirectional orientation ('647 col 10, ln 15-55. Yano et al also discloses the zirconium oxide

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thin film is composed mainly of zirconium oxide or zirconium oxide stabilized with a rare earth metal ('647 col 45-67). Yano et al also discloses a silicon substrate with a (100) orientation ('647 col 9, ln 60 to col 10, ln 15). Yano et al also discloses the film structure can form electronic devices ('647 col 16, ln 5-20). Yano et al also discloses in the ferroelectric thin film of PbTiO_3 , where part of Ti may be replaced by at least Zr ('647 col 9, ln 55-65 and col 8, ln 10-67), this reads on applicant's PZT.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yano et al (US 5,801,105) or Yano et al (JP 10-017394), where US 6,121,647 is used as an accurate translation

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of JP 10-017394 or Yano et al (JP 10-017394), where an English computer translation (CT) is used as an accurate translation, in view of Moon (US 5,744,374) or Nashimoto (US 5,834,803).

Yano et al ('105) or Yano et al ('394) teach all of the limitations of claim 9 including a ZrO_2 layer on a silicon substrate, as discussed previously, except the buffer layer comprises Y_2O_3 .

In a method of forming a ferroelectric film, note entire reference, Moon teaches a Silicon substrate and a yttrium oxide (Y_2O_3) film over the substrate and a ferroelectric film formed over the yttrium oxide layer (col 4, ln 40-55). Moon also teaches when a PT (PbTiO_3) ferroelectric film is formed on the yttrium oxide film it is possible to form a good quality ferroelectric film can be formed on a silicon semiconductor substrate (col 4, ln 1-15 and col 5, ln 1-5). It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Yano et al ('105) or Yano et al ('394) with Moon's yttrium layer between a silicon substrate and a PT layer to form a good quality film.

In a method of forming a ferroelectric film, note entire reference, Nashimoto teaches a single crystal substrate 1 of silicon (100) (col 3, ln 65 to col 4, ln 5 and col 10, ln 20-35), an epitaxial buffer layer 5 of MgO , ZrO_2 or Y_2O_3 (col 4, ln 10-15), a first ferroelectric thin film layer 2 and a second ferroelectric thin film layer 3, thereon. Nashimoto also teaches the first and second ferroelectric thin films include ABO_3 type ferroelectric substances such as LiNbO_3 , PZT, BaTiO_3 and PbTiO_3 (col 4, ln 16-67 and col 10, ln 35-40). Nashimoto also teaches a PbTiO_3 (001) film grown on a buffer and the PbTiO_3 is a perovskite (col 10, ln 41-67). Nashimoto also teaches the first and second ferroelectric thin films may be formed from different ferroelectric substances (col 4, ln 55-60). It would have been obvious to a person of ordinary skill in the art at

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the time of the invention to modify Yano et al ('105) or Yano et al ('394) ZrO₂ layer by substituting Nashimoto's Y₂O₃ layer because substitution of known equivalents for the same purpose is held to be obvious. (MPEP 2144.06).

Response to Arguments

9. Applicant's arguments with respect to claims 1-2 and 4-9 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew J Song whose telephone number is 703-305-4953. The examiner can normally be reached on M-F 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 703-305-2667. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Matthew J Song
Examiner
Art Unit 1765

MJS

NADINE G. NORTON
PRIMARY EXAMINER

